

CLAIMS

WE CLAIM:

1. An isolated LMP nucleic acid comprising a polynucleotide sequence encoding a polypeptide that functions as a modulator of a seed storage compound in a plant, wherein the polynucleotide sequence is selected from the group consisting of:
 - a) a polynucleotide sequence as defined in SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:5, SEQ ID NO:7, SEQ ID NO:9, SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15, SEQ ID NO:17, SEQ ID NO:19, SEQ ID NO:21, SEQ ID NO:23, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:37, SEQ ID NO:39, SEQ ID NO:41, SEQ ID NO:43, SEQ ID NO:45, SEQ ID NO:47, SEQ ID NO:51, SEQ ID NO:53, SEQ ID NO:55, SEQ ID NO:57, SEQ ID NO:59, SEQ ID NO:61, SEQ ID NO:63, SEQ ID NO:65, SEQ ID NO:67, SEQ ID NO:69, SEQ ID NO:71, SEQ ID NO:73, SEQ ID NO:75, SEQ ID NO:77, SEQ ID NO:79, and SEQ ID NO:81; and
 - b) a polynucleotide sequence encoding a polypeptide as defined in: SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:16, SEQ ID NO:18, SEQ ID NO:20, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:26, SEQ ID NO:28, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:34, SEQ ID NO:36, SEQ ID NO:38, SEQ ID NO:40, SEQ ID NO:42, SEQ ID NO:44, SEQ ID NO:46, SEQ ID NO:48, SEQ ID NO:52, SEQ ID NO:54, SEQ ID NO:56, SEQ ID NO:58, SEQ ID NO:60, SEQ ID NO:62, SEQ ID NO:64, SEQ ID NO:66, SEQ ID NO:68, SEQ ID NO:70, SEQ ID NO:72, SEQ ID NO:74, SEQ ID NO:76, SEQ ID NO:78, SEQ ID NO:80, and SEQ ID NO:82.
2. The isolated LMP nucleic acid Claim 1, wherein the polynucleotide sequence encodes a polypeptide sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:16, SEQ ID NO:18, SEQ ID NO:20, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:26, SEQ ID NO:28, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:34, SEQ ID NO:36, SEQ ID NO:38, SEQ ID NO:40, SEQ ID NO:42, SEQ ID NO:44, SEQ ID NO:46, SEQ ID NO:48, SEQ ID NO:52, SEQ ID NO:54, SEQ ID NO:56, SEQ ID NO:58, SEQ ID NO:60, SEQ ID

NO:62, SEQ ID NO:64, SEQ ID NO:66, SEQ ID NO:68, SEQ ID NO:70, SEQ ID NO:72, SEQ ID NO:74, SEQ ID NO:76, SEQ ID NO:78, SEQ ID NO:80, and SEQ ID NO:82.

3. The isolated LMP nucleic acid of Claim 1, wherein the polynucleotide sequence is selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:5, SEQ ID NO:7, SEQ ID NO:9, SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15, SEQ ID NO:17, SEQ ID NO:19, SEQ ID NO:21, SEQ ID NO:23, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:37, SEQ ID NO:39, SEQ ID NO:41, SEQ ID NO:43, SEQ ID NO:45, SEQ ID NO:47, SEQ ID NO:51, SEQ ID NO:53, SEQ ID NO:55, SEQ ID NO:57, SEQ ID NO:59, SEQ ID NO:61, SEQ ID NO:63, SEQ ID NO:65, SEQ ID NO:67, SEQ ID NO:69, SEQ ID NO:71, SEQ ID NO:73, SEQ ID NO:75, SEQ ID NO:77, SEQ ID NO:79, and SEQ ID NO:81.
4. An isolated nucleic acid comprising a polynucleotide of least 60 consecutive nucleotides the LMP nucleic acid of Claim 1.
5. An isolated nucleic acid comprising a polynucleotide having at least 70% sequence identity with the LMP nucleic acid of Claim 1.
6. An isolated nucleic acid comprising a polynucleotide having at least 90% sequence identity with the LMP nucleic acid of Claim 1.
7. An isolated nucleic acid comprising a polynucleotide complementary to the LMP nucleic acid of Claim 1.
8. An isolated nucleic acid that hybridizes under stringent conditions to the nucleic acid of Claim 1.
9. An expression vector comprising an LMP nucleic acid of Claim 1.
10. The expression vector of Claim 9, wherein the LMP nucleic acid is operatively linked to a heterologous promoter selected from the group consisting of a seed-specific promoter, a root-specific promoter, and a non-tissue-specific promoter.

11. A method of producing a transgenic plant having a modified level of a seed storage compound comprising, transforming a plant cell with an expression vector comprising a lipid metabolism protein (LMP) nucleic acid and generating from the plant cell the transgenic plant, wherein the nucleic acid encodes a polypeptide that functions as a modulator of a seed storage compound in the plant, and wherein the nucleic acid comprises a polynucleotide sequence selected from the group consisting of:

- a) a polynucleotide sequence as defined in SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:5, SEQ ID NO:7, SEQ ID NO:9, SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15, SEQ ID NO:17, SEQ ID NO:19, SEQ ID NO:21, SEQ ID NO:23, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:37, SEQ ID NO:39, SEQ ID NO:41, SEQ ID NO:43, SEQ ID NO:45, SEQ ID NO:47, SEQ ID NO:51, SEQ ID NO:53, SEQ ID NO:55, SEQ ID NO:57, SEQ ID NO:59, SEQ ID NO:61, SEQ ID NO:63, SEQ ID NO:65, SEQ ID NO:67, SEQ ID NO:69, SEQ ID NO:71, SEQ ID NO:73, SEQ ID NO:75, SEQ ID NO:77, SEQ ID NO:79, and SEQ ID NO:81; and
- b) a polynucleotide sequence encoding a polypeptide as defined in SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:16, SEQ ID NO:18, SEQ ID NO:20, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:26, SEQ ID NO:28, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:34, SEQ ID NO:36, SEQ ID NO:38, SEQ ID NO:40, SEQ ID NO:42, SEQ ID NO:44, SEQ ID NO:46, SEQ ID NO:48, SEQ ID NO:52, SEQ ID NO:54, SEQ ID NO:56, SEQ ID NO:58, SEQ ID NO:60, SEQ ID NO:62, SEQ ID NO:64, SEQ ID NO:66, SEQ ID NO:68, SEQ ID NO:70, SEQ ID NO:72, SEQ ID NO:74, SEQ ID NO:76, SEQ ID NO:78, SEQ ID NO:80, and SEQ ID NO:82.

12. The method of Claim 11, wherein the LMP nucleic acid comprises a polynucleotide sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:5, SEQ ID NO:7, SEQ ID NO:9, SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15, SEQ ID NO:17, SEQ ID NO:19, SEQ ID NO:21, SEQ ID NO:23, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:29, SEQ ID NO:31, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:37, SEQ ID NO:39, SEQ ID NO:41, SEQ ID NO:43, SEQ ID NO:45, SEQ ID NO:47, SEQ ID NO:51, SEQ ID NO:53, SEQ ID NO:55, SEQ ID NO:57, SEQ ID NO:59, SEQ ID NO:61, SEQ ID NO:63, SEQ ID NO:65, SEQ ID NO:67, SEQ ID NO:69, SEQ ID NO:71, SEQ ID NO:73, SEQ ID NO:75, SEQ ID NO:77, SEQ ID NO:79, and SEQ ID NO:81.

13. The method of Claim 11, wherein the LMP nucleic acid comprises a polynucleotide sequence encoding a polypeptide selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:16, SEQ ID NO:18, SEQ ID NO:20, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:26, SEQ ID NO:28, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:34, SEQ ID NO:36, SEQ ID NO:38, SEQ ID NO:40, SEQ ID NO:42, SEQ ID NO:44, SEQ ID NO:46, SEQ ID NO:48, SEQ ID NO:52, SEQ ID NO:54, SEQ ID NO:56, SEQ ID NO:58, SEQ ID NO:60, SEQ ID NO:62, SEQ ID NO:64, SEQ ID NO:66, SEQ ID NO:68, SEQ ID NO:70, SEQ ID NO:72, SEQ ID NO:74, SEQ ID NO:76, SEQ ID NO:78, SEQ ID NO:80, and SEQ ID NO:82.

14. The method of Claim 11, wherein the level of a seed storage compound is increased in the transgenic plant as compared to the wild type plant.

15. The method of Claim 14, wherein the LMP nucleic acid encodes the polypeptide as defined in SEQ ID NO:28.

16. The method of Claim 11, wherein the LMP nucleic acid is operatively linked to a heterologous promoter selected from the group consisting of a seed-specific promoter, a root-specific promoter, and a non-tissue-specific promoter.

17. The method of Claim 11, wherein the modified level of the seed storage compound is due to the overexpression or down-regulation of the LMP nucleic acid.

18. A method of producing a transgenic plant having a modified level of a seed storage compound comprising, transforming a plant cell with an expression vector comprising an LMP nucleic acid, and generating from the plant cell the transgenic plant, wherein the LMP nucleic acid comprises a polynucleotide sequence that encodes a polypeptide that functions as a modulator of a seed storage compound in the plant, and wherein the LMP nucleic acid comprises a polynucleotide of least 60 consecutive nucleotides of the LMP nucleic acid of Claim 1.

19. A method of producing a transgenic plant having a modified level of a seed storage compound comprising, transforming a plant cell with an expression vector comprising an LMP nucleic acid and generating from the plant cell the transgenic plant, wherein the nucleic acid encodes a polypeptide that functions as a modulator of a seed storage compound in the plant, and wherein the LMP nucleic acid comprises a polynucleotide having at least 70% sequence identity with the LMP nucleic acid of Claim 1.
20. The method of Claim 19, wherein the LMP nucleic acid comprises a polynucleotide having at least 90% sequence identity with the LMP nucleic acid of Claim 1.
21. A method of producing a transgenic plant having a modified level of a seed storage compound comprising, transforming a plant cell with an expression vector comprising a LMP nucleic acid and generating from the plant cell the transgenic plant, wherein the nucleic acid encodes a polypeptide that functions as a modulator of a seed storage compound in the plant, and wherein the LMP nucleic acid comprises a first nucleic acid that hybridizes under stringent conditions to the nucleic acid of Claim 1.
22. A method of producing a transgenic plant having a modified level of a seed storage compound comprising, transforming a plant cell with an expression vector comprising a LMP nucleic acid and generating from the plant cell the transgenic plant, wherein the nucleic acid encodes a polypeptide that functions as a modulator of a seed storage compound in the plant, and wherein the LMP nucleic acid comprises a polynucleotide complementary to the LMP nucleic acid of Claim 1.
23. The method of any one of Claims 11, 18, 19, 20, 21, or 22, wherein the modified level of the seed storage compound is due to the overexpression or down-regulation of the LMP nucleic acid.
24. A method of modulating the level of a seed storage compound in a plant comprising, modifying the expression of an LMP nucleic acid in the plant, wherein the LMP nucleic acid is selected from the group consisting of the LMP nucleic acids of Claims 1, 4, 5, 6, 7, or 8.
25. The method of any one of Claims 11, 18, 19, 20, 21, or 22, wherein the LMP nucleic acid encodes a polypeptide that contains a DNA-binding domain.

26. The method of Claim 25, wherein the LMP nucleic acid encodes a polypeptide selected from the group consisting of SEQ ID NO:2, SEQ ID NO:16, SEQ ID NO:28, SEQ ID NO:34, SEQ ID NO:64, SEQ ID NO:74, and SEQ ID NO:80.
27. The method of Claims 11, 18, 19, 20, 21, or 22, wherein the nucleic acid encodes a polypeptide that contains a protein kinase domain
28. The method of Claim 27, wherein the nucleic acid encodes a polypeptide selected from the group consisting of SEQ ID NO:20, SEQ ID NO:44, SEQ ID NO:46, and SEQ ID NO:62.
29. The method of Claims 11, 18, 19, 20, 21, or 22, wherein the nucleic acid encodes a polypeptide that contains a signal transduction domain.
30. The method of Claim 29, wherein the nucleic acid encodes a polypeptide selected from the group consisting of SEQ ID NO:4, SEQ ID NO:12, SEQ ID NO:42, SEQ ID NO:48, SEQ ID NO:56, SEQ ID NO:68, and SEQ ID NO:72.
31. The method of Claims 11, 18, 19, 20, 21, or 22, wherein the nucleic acid encodes a polypeptide that contains a protease domain.
32. The method of Claim 31, wherein the nucleic acid encodes a polypeptide selected from the group consisting of SEQ ID NO:8, SEQ ID NO:38, SEQ ID NO:40, SEQ ID NO:52, and SEQ ID NO:66.
33. The method of Claims 11, 18, 19, 20, 21, or 22, wherein the nucleic acid encodes a polypeptide that contains a lipid metabolism domain.
34. The method of Claim 33, wherein the nucleic acid encodes a polypeptide selected from the group consisting of SEQ ID NO:6, SEQ ID NO:10, SEQ ID NO:14, SEQ ID NO:18, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:26, and SEQ ID NO:30.

35. The method of claims 11, 18, 19, 20, 21, or 22, wherein the nucleic acid encodes a polypeptide that contains an oxidoreductase domain.
36. The method of claim 35, wherein the nucleic acid encodes a polypeptide selected from the group consisting of SEQ ID NO:32, SEQ ID NO:36, SEQ ID NO:54, SEQ ID NO:58, SEQ ID NO:60, SEQ ID NO:70, SEQ ID NO:76, SEQ ID NO:78, and SEQ ID NO:82.
37. A transgenic plant made by the method any one of the methods of claims 11, 18, 19, 20, 21, or 22, wherein expression of the LMP nucleic acid in the plant results in a modified level of a seed storage compound in the plant as compared to a wild type variety of the plant.
38. The transgenic plant of Claim 37, wherein the plant is a dicotyledonous plant.
39. The transgenic plant of Claim 37, wherein the plant is a monocotyledonous plant.
40. The transgenic plant of Claim 37, wherein the plant is an oil producing species.
41. The transgenic plant of Claim 37, wherein the plant is selected from the group consisting of rapeseed, canola, linseed, soybean, sunflower, maize, oat, rye, barley, wheat, sugarbeet, tagetes, cotton, oil palm, coconut palm, flax, castor, and peanut.
42. The transgenic plant of Claim 37, wherein the level of the seed storage compound is increased in the transgenic plant as compared to the wild type variety of the plant.
43. The transgenic plant of Claim 42, wherein the LMP nucleic acid encodes the polypeptide as defined in SEQ ID NO:28.
44. The transgenic plant of Claim 37, wherein the seed storage compound is selected from the group consisting of a lipid, a fatty acid, a starch, and a seed storage protein.
45. A seed produced by the transgenic plant of Claim 37, wherein the plant expresses the LMP polypeptide and wherein the plant is true breeding for a modified level of the seed storage compound as compared to a wild type variety of the plant.

46. A seed oil produced by the seed of Claim 45.